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that he will be well taught who follows this bulky manual faithfully through. The work has been thoroughly revised, largely rewritten, and very much increased in size, by Professor Rolleston's collaborator and successor, Mr. W. H. Jackson. For the benefit of those who are not familiar with the former edition (and there are comparatively few students in recent years in America who are familiar with it), a few words relative to the scope of the volume may be given. The first part of the volume is essentially a laboratory guide, illustrated by plates, of the anatomy of various selected types of animal structure; the second and larger part contains systematic morphological descriptions of the classes and higher divisions of the animal kingdom, with briefer discussions of the different orders, both fossil and recent. The descriptions are very comprehensive, essentially comparative, and modern. Not the least valuable part of the work are the bibliographies appended, in both parts, to type or class, and so arranged as to open up to the student special lines of study in any direction he may select.

The work is alike valuable to the special student and teacher of comparative anatomy, and will be scarcely less useful to the paleontologist and college teacher of zoölogy, as well as forming an excellent adjunct and continuation to Huxley and Martin. To the undergraduate, or even non-specialist post-graduate, almost its only service will be that of a work of reference. As Professor Rolleston says, the distinctive character of the book "consists in its attempting to so combine the concrete facts of zoötomomy with the outlines of systematic classification as to enable the student to put them for himself into the natural relations of foundation and superstructure." But no student can appreciate or grasp the broad morphological principles underlying classification until he has first familiarized himself with the details upon which those principles are based. In Huxley and Martin's 'Biology' the other extreme is taken, and facts, only, presented; in the present work we believe that a much more thorough acquaintance with the actual structure of animal bodies is needed than is presented in the first part, before the student can avail himself of the more systematic morphological portion. The work is not complete in itself; it needs and will be supplemented by others; nevertheless it is one that no zoötomist or zoölogist can afford to be without.

A Course of Elementary Instruction in Practical Biology. By T. H. HUXLEY. Revised and edited by G. B. Howes and D. H. Scott. London and New York, Macmillan. 16°. \$2.60.

HUXLEY and Martin's 'Practical Biology' has long since won an enviable place as a text-book in our best institutions, and the present edition contains many important improvements that will meet the approbation of teachers. In size, the present is nearly twice that of the former edition, and its arrangement has been materially changed. Especially do we approve of the principle, that has already been accepted by other authors in similar treatises, of starting the student in on work that is more familiar to him, and gradually leading him to less familiar fields, rather than the adherence to a more logical and systematic but less practical view of living structure. In the present edition the arrangement has been so changed that the student is first taken through a careful study of the frog, and then follows successively the study of the cray-fish, earth-worm, snail, mussel, polyps, animalcules, yeast, protococcus, *Spirogyra*, bacteria, moulds, stoneworts, fern, and bean. Even with the present arrangement, we believe that the student's interest would be sharpened, and his skill increased, by a preliminary study of the best-known and most familiar of all structures, the human body. The portion devoted to the frog has been most largely increased; and the additions of the earth-worm, snail, and *Spirogyra* add to the value of the book. The appendix is a happy addition to the work, and is a good, fresh, and succinct account of microscopic material and technique.

The work is undoubtedly accurate: the authors' names are not needed as a guaranty of this. The omission of figures and plates is objectionable to some; but the true use of the work, that of a guide to the student in the examination of specimens for himself, neither requires nor desires such. It is too advanced for the general undergraduate student, but is excellent for post-graduate work in preparation for medical studies. Some day, though we fear it may be far in the future, such preliminary work as this will be re-

quired of all medical students: it would go far towards mitigating the very just opprobrium under which most medical colleges of our country now suffer, — that of being the most unscientific of all scientific schools. The work would be improved by a more comparative morphological treatment. But little is said of the general principles underlying structure, and the relations of the general types are not made apparent, as they should be.

A Popular Zoölogy. By J. DORMAN STEELE and J. W. P. JENKS. New York and Chicago, Barnes. 12°. \$1.40.

First Lessons in Zoölogy. By A. S. PACKARD. 2d ed. New York, Holt. 12°. \$1.

BOTH of the above text-books are by well-known authors, coming simultaneously from Brown University, and both are worthy of commendation; but both are not of like merit in all respects, nor adapted for the same class of pupils. Steele and Jenks's book is designed to interest and instruct; Packard's, to instruct and interest. The former is more elementary and popular; the latter, for a somewhat older grade of pupils, and is more scientific. The one deals with the familiar forms of life more fully, — there is an undue amount on birds, — and is rather too much after the style of Tenney; Packard's work is more philosophical, and treats of principles rather than of details.

It is very difficult in a text-book on zoölogy, especially one intended for young pupils, to hit the happy mean between meaningless details and a dry, uninteresting compendium of comparative anatomy. Furthermore, the value of an elementary zoölogy depends upon who the teacher is. If he is, as is too often the case, one who knows as much about the principles of zoölogy as he does of those of the Aztec language, then no book will be of much value; if he is a good zoölogist himself, he does not rely very exclusively upon any text-book. For the pupil who must depend largely upon himself, Steele and Jenks's book, with its numerous good illustrations and anecdotal style, can be recommended; but, for the more scientific yet interesting application of the principles of animal life and its classification by a qualified teacher, the excellency of Packard's work cannot be gainsaid. The additions in the present edition of the last work are confined to the *Insecta*, *Ctenophores*, and the horseshoe crab.

NOTES AND NEWS.

IN 1887 an association was formed in Ireland for the promotion of silk-culture in the south of the island. The hope was, to utilize land now devoted to very unproductive crops. The Journal of the Society of Arts states that the river-valleys of Munster are especially suited for the growth of the mulberry-tree. The present effort to introduce silk-cultivation divides itself into two parts, — first the cultivation of the mulberry-tree, and next the rearing of cocoons. To accomplish these objects of the association it is proposed, and is actually being done on a small scale, to distribute mulberry-trees among those who last year reared such silk as to "equal any Italian or other silk." Count Dandolo, in his Italian appears peculiarly favorable to the cultivation of silk. The experiment of rearing silkworms is being tried, by about thirty families, but large results are not expected at once, as the imported mulberry-trees will not leaf well in the first year. It is remarked, that, if the re-forestation of Ireland be desirable, some of the trees should be the useful mulberry. Another part of the scheme is to introduce reeling-machines, which can be used by ladies in their own homes. Sericulture has been in every country rather an occupation for the family than for the factory, which gives it a special claim to attention, at a time when those whose circumstances forbid them from seeking employment outside their own homes are suffering keenly from the general depression.

— The Society of Science of Harlem has just published Volume I. of the works of the illustrious Huygens. This is a volume which will be of special value to the physicists and historians, and we can but commend this republication of the works of the pioneers in science. The Physical Society of France has done a similar piece of service in republishing the works of Coulomb and Ampère.

— M. Wolf announced at the meeting in the French Academy, June 11, that Captain Dfforges had discovered in the archives of the Ecole des Ponts et Chaussées a number of notes by Prony which show him to have been the discoverer of the modern methods of determining the force of gravity. In 1792 Prony proposed to substitute for the simple pendulum a rod oscillating successively on three parallel knife-edges. Later, in 1800, the study of his first apparatus led him to a contrivance which was nothing less than the reversion-pendulum proposed in 1811 by Bohnenberger, and applied for the first time by Captain Kater in 1817. Unfortunately the many professional occupations of Prony and his journeys did not permit him to make such a pendulum, and the memoir of 1800 was never published.

— An exhibition of hygiene opens at the Palace of Industry in Paris on the 20th of July. Another exhibition for the same purpose, also containing a section devoted to the fine arts and the industrial arts, opened at Ostend on the 30th of June.

— A recent number of the San Francisco *Bulletin* contains some facts as to the exhibition under the auspices of the California State Board of Silk Culture. "The exhibition is of a highly practical nature, and comprises, in addition to reels, filatures, and cocoons, over fifty thousand worms in different phases of development, a great number of which, however, have reached the spinning-stage, and are industriously engaged in the evolving of their costly product. The manager of the work, Mrs. Louise Rienzi, is an enthusiast in regard to sericulture, and is to be largely credited for the rapid progress made by the board during the two years it has been established. The impetus given to sericulture in California by the labors of the board has pushed the industry forward vastly. Large invoices of cocoons are daily received, besides considerable quantities of raw silk sent to be spun on the improved filature machinery imported from Italy for this purpose. Appropriately enough, the majority of those who have engaged in silk-culture in the State are ladies. Communications are received every day from those desirous of obtaining information necessary to the establishing of silk-farms. Besides being furnished with a book of instruction, all who apply may obtain eggs or worms in embryo, as well as mulberry leaves, trees, and cuttings. Fully sixteen thousand trees and cuttings were distributed last spring as food-supplies for the worms on silk-farms located at Dutch Flat, Paso Robles, Brentwood, Antioch, Howell Mountain, Sebastopol, Visalia, Santa Paula, Templeton, Chico, Rutherford, San José, Irvington, Danville, Anderson, Los Angeles, Eureka, San Bernardino, Fresno, Livermore, Boulder Creek, and numerous other towns throughout the State. The leaves of one three-year-old tree are estimated to be sufficient for the nourishment of an entire colony of silkworms, while one hundred trees will supply the wants of as many worms as can be attended to in any but the largest establishments. The supply of trees and cuttings at the command of the board was exhausted early in the present season, but the many applications held over will be filled from the stock of fifty thousand trees which will be procured for next season.

— The *American Meteorological Journal*, desiring to direct the attention of students to tornadoes, in hopes that valuable results may be obtained, offers the following prizes: for the best original essay on tornadoes, or description of a tornado, two hundred dollars will be given; for the second best, fifty dollars; and among those worthy of special mention fifty dollars will be divided. The essays must be sent to either of the editors, Professor Harrington, Astronomical Observatory, Ann Arbor, Mich., or A. Lawrence Rotch, Blue Hill Meteorological Observatory, Readville, Mass., U.S.A., before the first day of July, 1889. They must be signed by a *nom de plume*, and be accompanied by a sealed envelope addressed with same *nom de plume*, and enclosing the real name and address of the author. Three independent and capable judges will be selected to award the prizes; and the papers receiving them will be the property of the journal offering the prizes. A circular giving fuller details can be obtained by application to Professor Harrington.

— At the meeting of the Engineers' Club of Philadelphia on June 16 it was voted that the club join in the invitation, which had been

extended by other societies, to the International Congress of Geologists, to hold its fifth session, in 1891, in the city of Philadelphia.

— In his article in a recent number of *The Forum*, Professor Thurston takes occasion to remark that the world is awaiting the appearance of three inventors greater than any who have gone before, and to whom it will accord honors and emoluments far exceeding all ever yet received by any of their predecessors. The first is he who will show us how, by the combustion of fuel, directly to produce the electric current; the second is the man who will teach us to reproduce the beautiful light of the glow-worm and the firefly, a light without heat, the production of which means the utilization of energy without a waste still more serious than the thermo-dynamic waste; while the third is the inventor who is to give us the first practically successful air-ship.

— The Manhattan Chapter, New York, of the Agassiz Association, held a silk exhibition at 103 Lexington Avenue, commencing Friday evening, June 29, at 8 P.M., with a lecture on silk by C. F. Groth, and continuing Saturday, June 30, from 3 to 10 P.M.; Sunday, July 1, from 3 to 10 P.M.; and Monday, July 2, from 3 to 10 P.M.

— Prof. H. P. Bowditch has made an important contribution to the growing literature of the 'knee-jerk' phenomenon, the importance of which as an index of nervous condition is now so widely recognized. Using an apparatus that allows the force of the blow and the extent of the excursion to be recorded, he asks the subject to firmly clinch the hand (and thus re-enforce the knee-jerk) upon a given signal. After an interval varying from .1 of a second to 1.7 seconds, the blow is struck, and it is found that the effect of the re-enforcement varies with the interval. It is greatest immediately after the hand is clinched, and with an interval of .4 of a second has disappeared. With an interval of .4 of a second to 1 second, there is a diminution of the knee-jerk, followed by an increase, reaching the normal again at 1.7 seconds. There is thus a short period of exaltation, followed by a depression and a slow return to the normal.

— A paragraph is going the rounds of the press, with what truth we know not, to the effect that a company was recently started in Philadelphia for the purpose of investigating the pyramids of Egypt by boring into them with diamond drills, thereby penetrating into some of the mysteries which have so successfully baffled the investigators of centuries.

— The observations of M. Perrotin at Nice, and M. Terby at Louvain, and, in England, of Mr. Denning at Bristol, have confirmed, according to *Nature*, the presence on the planet Mars of most of the 'canals' or narrow dark lines which were discovered by M. Schiaparelli in 1877, and at subsequent oppositions. M. Perrotin has also been able to detect, in several cases, the gemination or doubling of the canals, and M. Terby has observed the same phenomenon in one or two cases, but with much greater difficulty than in the opposition of 1881-82. But some curious changes of appearance have been noted. An entire district (Schiaparelli's *Lybia*) has been merged in the adjoining 'sea'; i.e., its color has changed from the reddish hue of the Martial 'continents' to the sombre tint of the 'seas.' The district in question is larger than France. To the north of this district a new canal has become visible, and again another new canal has appeared to traverse the white north polar cap, or, according to M. Terby, to divide the true polar cap from a white spot of similar appearance a little to the south of it. With the exception of these changes, the principal markings, both light and dark, are those which former oppositions have rendered familiar.

— We learn from *Nature* that admirable arrangements have been made for the London meeting of the International Geological Congress, from Sept. 17 to 22 next. The meetings will be held in the rooms of the University of London, Burlington Gardens, where accommodation for the council, committees, exhibition, etc., has been granted by the senate of the university. There is a refreshment-room in the building, and there are several restaurants and hotels in the immediate neighborhood. Arrangements will be made at one of these restaurants for a room to be set apart for the social meetings of members of the congress. The opening meet-

ing of the congress will take place on Monday evening, Sept. 17, at 8 P.M., when the council will be appointed, and the general order of business for the session will be determined. The ordinary meetings of the congress will be held on the mornings of Tuesday, the 18th, and succeeding days, beginning at 10 A.M. In the afternoons there will be visits to museums, or to places of interest in the neighborhood of London. Arrangements for the evenings will be made at a later date. The ordinary business of the congress will include the discussion of questions not considered at Berlin, or adjourned thence for fuller discussion at the London meeting. Among these are the geological map of Europe, the classification of the Cambrian and Silurian rocks and of the Tertiary strata, and some points of nomenclature, etc., referred to the congress by the International Commission. Miscellaneous business will also be considered. In addition to these questions, the organizing committee proposes to devote a special sitting to a discussion on the crystalline schists. An exhibition will be held during the week of the congress, to which geologists are invited to send maps, recent memoirs, rocks, fossils, etc. Foreign members of the congress are invited by the council of the British Association to attend the meeting of that association at Bath. During the week when the association meets, there will be short excursions in the neighborhood of Bath, and longer excursions will be made after the meeting. At these excursions excellent sections of the lower secondary and upper paleozoic rocks will be visited. Excursions will take place in the week after the meeting of the congress (Sept. 24 to 30). The number of these will depend upon the number of members desirous of attending, and upon the districts which they most wish to visit. The excursions at present suggested are: (1) The Isle of Wight (visiting the Ordnance Survey Office at Southampton on the way), cretaceous, eocene, oligocene. (2) North Wales, Pre-Cambrian and the older paleozoic rocks; West Yorkshire (Ingleborough, etc.), Silurian and carboniferous limestone. (3) East Yorkshire (Scarborough, Whitby, etc.), Jurassic and cretaceous. Should the number of members be so large as to make additional excursions necessary, they will probably be: (4) Norfolk and Suffolk, pliocene (crag) and glacial beds. (5) To the Jurassic rocks of central England. The short excursions during the week of the congress will probably be to Windsor and Eton, to St. Albans, to Watford, to Brighton, to the Royal Gardens at Kew, and to other places of interest. Brief descriptions of the districts to be visited in these excursions will be prepared (with illustrative sections, etc.), and will, if possible, be sent to members before the meeting. The full report of the London meeting will be issued soon after the close of the session. It will contain, in addition to reports of the ordinary business of the congress, the report of the American committee on nomenclature (about 230 pages); the memoirs on the crystalline schists (about 150 pages), and reports of discussion on the same; and probably a reprint, with additions, of the report of the English committee on nomenclature (about 150 pages).

— An international horticultural exhibition, we learn from *Nature*, is to be held at Cologne from Aug. 4 to Sept. 19.

— On the 4th of June, according to *Nature*, Dr. Maxwell T. Masters was elected a corresponding member of the Institute of France, in the Botanical Section, in place of the late Prof. Asa Gray. Besides Dr. Masters, the following names appeared on the list of presentation: M. Treub of Batavia, Mr. Triana of Paris, M. Warming of Lund, M. Wiesener of Vienna. Dr. Masters obtained 39 votes; M. Triana, 5; M. Treub, 1.

— We are glad to learn (from *Nature*) that a pension of £50 has been granted to Mrs. Balfour Stewart from the civil list.

— Messrs. Thomas Whittaker & Sons, New York, have published an admirable 'Planisphere showing the Principal Stars visible for Every Hour in the Year.' It is substantially made, and convenient for use in our latitude. — *Outing* for July opens with 'An Irish Outing Awheel,' from the pen of 'Faed' Wilson. The illustrations of Irish scenery by Harry Fenn are handsomely reproduced. The number contains plenty of summer matter. Samuel M. Baylis is the author of 'After Trout in Canadian Waters.' Other articles are 'Richfield Springs,' by Mrs. M. B. Hedges; 'The Angling Tournament,' by Francis Endicott; etc. — The

July volumes of Ticknor's Paper Series will be as follows: 'Two College Girls,' by Helen Dawes Brown, ready July 7; and 'The Rise of Silas Lapham,' by William D. Howells, ready July 21. — Macmillan & Co. are about to publish in two volumes a second series of Carlyle's letters, extending from 1826 to 1835, edited by Professor Norton. — The J. B. Lippincott Company have in press 'Stanley to the Rescue: the Relief of Emin Pacha,' by A. Wauters, president of the Royal Geographical Society of Belgium. It will contain a map and thirty-four illustrations. — G. P. Putnam's Sons publish this week 'The Story of Turkey,' by Stanley Lane-Poole, which forms the nineteenth volume of the story of the Nations Series.

— Mr. Joseph Jastrow has been elected professor of experimental and comparative psychology at the University of Wisconsin. This is very gratifying, as it shows an interest in this country in the scientific aspect of mind.

LETTERS TO THE EDITOR.

* * * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

The Rainfall at Fort Leavenworth, Kan.

IN 1837 rainfall observations were instituted at Fort Leavenworth under the supervision of the post surgeon, and the record was continued, with but few breaks, until October, 1883. In the latter year, in view of the proximity of the Signal Service station in Leavenworth City, the authorities at the War Department, or the officers at the fort, suffered this magnificent record to be discontinued. The length of the series, surpassing any other record west of the Mississippi, and antedating by almost twenty years the settlement of Kansas by the white man, has made it of especial value as evidence upon the question of a secular change in rainfall over the Western plains.

The observations up to 1874 were rendered generally available by their publication in the 'Smithsonian Precipitation Tables' and in the 'Report of the Kansas Board of Agriculture for 1874;' for the years 1871 to 1880 they were published in 'Professional Paper No. IX.' of the Signal Service; and for 1881 to 1883 they have not been printed, or at least have not become generally accessible. The series subsequent to 1873 seems, moreover, to have been little used, and discussions of secular change in rainfall have generally been made by completing the Fort Leavenworth series since 1873 with the Signal Service records at Leavenworth City, the entire comparability of the two series being assumed without investigation or proof.

That this assumption is quite unscientific, and that it is liable to lead to erroneous results, does not need to be argued before the careful meteorologist. The difference in the rules and methods of observation and the spirit of the observers, as well as the difference in the locations and exposures of the gauges and in the gauges themselves, furnish abundant room for systematic discrepancy.

With the record thus constructed out of the two series of observations, an average increase of seven inches seemed to have occurred during the past twenty years, and this result has been widely used to confirm the belief in a permanent increase in the rainfall over the Western plains. For the reasons above stated, this conclusion seems to me to stand in need of a complete re-examination. In a preliminary survey of the Fort Leavenworth observations as printed, errors were discovered that showed the necessity of a thorough scrutiny of the original data (see *Science*, xi. No. 272).

In order to make the desired examination, I have visited Fort Leavenworth, and through the courtesy of Major Alfred A. Woodhull, Surgeon U.S.A., was enabled to make copies of the original records for the years not hitherto published, and for the periods needing confirmation. I am also indebted to Major Woodhull for certified copies of a portion of the records that have heretofore been incorrectly printed.

In view of the error already discovered, — namely, that the measured snowfall in January, 1871, had not been reduced to inches of